VISUAL FIELD AS A FRAME OF REFERENCE

WITH SPECIAL REGARD TO THE VERTICAL-HORIZONTAL ILLUSION

By

THEODOR M. KÜNNAPAS

STOCKHOLM 1959

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PREFACE

The aim of the present investigation is to point out that our visual field may be regarded as a frame of reference. Within the visual field all figures have a certain position in relation to the frame, which influences their perception in different ways. The influence is studied with special regard to the vertical-horizontal illusion and is further exemplified by the bisection of a line and the subjective center of a square diamond.

The present series of investigations was carried out in the Psychological Laboratory, University of Stockholm. The writer, however, is solely responsible for the contents of the report.

My most sincere thanks are due to Professor Gösta Ekman, the Head of the Psychological Laboratory, for his guidance, active interest and never-failing encouragement throughout my work. I also wish to offer my cordial thanks to Professor Gunnar Johansson of Uppsala, Professor Kjell Härnqvist of Göteborg, Docent Mats Björkman, fil. kand. Hannes Eisler and other colleagues at the Psychological Laboratory, for their encouragement and valuable discussions. My thanks are also due to my subjects for their help. I am indebted to Mr. Tryggve Johansson, who has constructed the apparatus and plotted the figures, and to Mr. Albert Read for revising the English text.

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THEODOR M. KÜNNAPAS

The Psychological Laboratory,
The University of Stockholm,
February 1959

This survey gives a summary of the results published in the following papers by the present writer:

I. An analysis of the "vertical-horizontal illusion". *J. Exp. Psychol.*, *1955*, 49, 134–140.
II. Influence of frame size on apparent length of a line. *J. Exp. Psychol.*, *1955*, 50, 168–170.
III. The vertical-horizontal illusion and the visual field. *J. Exp. Psychol.*, *1957*, 53, 405–407.
IV. Vertical-horizontal illusion and surrounding field. *Acta Psychol.*, *1957*, 13, 35–42 (& *Nord. Psykol.*, *1957*, 9, 35–42).
V. Interocular differences in the vertical-horizontal illusion. *Acta Psychol.*, *1957*, 13, 253–259 (& *Nord. Psykol.*, *1957*, 9, 195–201).
VI. Influence of head inclination on the vertical-horizontal illusion. *J. Psychol.*, *1958*, 46, 179–185.
VII. The vertical-horizontal illusion in artificial visual fields. *J. Psychol. 1959*, 47, 41–48.
VIII. Fixation and the vertical-horizontal illusion. *Acta Psychol.*, *1958*, 14, 131–136 (& *Nord. Psykol.*, *1958*, 10, 87–92).
IX. Measurements of subjective length in the vertical-horizontal illusion. *Acta Psychol.*, *1958*, 14, 371–374 (& *Nord. Psykol.*, *1958*, 10, 203–206).
X. Visual field and interocular differences in the bisection of a line. *Acta Psychol.*, *1958*, 14, 375–383 (& *Nord. Psykol.*, *1958*, 10, 207–215).
XI. Visual field and subjective center of a diamond. *J. Psychol.*, *1959*, 47, 305–316.

References to these papers will be made by the above Roman figures. The pertinent literature has been quoted in the papers listed above, and completed with three items in the survey.

ANALYSIS OF THE VERTICAL-HORIZONTAL ILLUSION

The series of investigations summarized here started with an analysis of the vertical-horizontal illusion.

In textbooks of psychology this illusion is often exemplified by the inverted T figure, more seldom it is made by an L-shaped pattern, which means that the same illusion is supposed to appear in both cases. The comparison of both figures with each other, however, indicated that they have not the same effect. The illusion is considerably greater in the inverted T figure. The remarkable difference between them aroused the doubt whether it is the same illusion that appears in both figures, and gave occasion to the present investigation.

Two observations confirmed the suspicion. The turning of the inverted T figure in the horizontal position so that the vertical line was horizontal showed that in this condition the horizontal line appears longer than the vertical. The same phenomenon is given in Figure 1 (I) where the inverted T pattern is completed with a horizontal line (*c*) of equal length so that it bisects the vertical line. The horizontal line (*c*) seems the longest of all three equal lines, even longer than the vertical line itself. With regard to the classical vertical-horizontal illusion this phenomenon is inexplicable, almost paradoxical. The only explanation is to assume that a new illusion appears in the inverted T figure which was by the writer called the illusion of the dividing line. We overestimate the dividing line in relation to the line divided.

The illusory effect of the inverted T figure, two L patterns and other vertical-horizontal figures was analysed in (I). According to the nine positions of the dividing line, nine different figures were used (Fig. 2, I). Among these figures were the inverted T figure as the midpoint position, and two L figures as two end positions. Four experimental conditions were arranged, according to the four directions of the dividing line (Fig. 3, I). In two conditions the dividing line was vertical, and in the other two conditions it was horizontal.

The analysis of the results indicated that the illusory effect in the vertical-horizontal figures is due to the two different illusions: (1) the

overestimation of the vertical line (OV) and (2) the illusion of the dividing line.

The main differences of these illusions are: (*a*) The OV is always related to the vertical position. The overestimation of the dividing line is independent of this position: in the horizontal direction it has the same size as in the vertical. (*b*) The vertical-horizontal illusion is constant in size. The size of the illusion of the dividing line is variable; it has a maximum at midpoint position (the inverted T figure) and two minima at the two end positions (the L figure). (*c*) When the dividing line is vertical and the divided line horizontal, the two illusions operate in the same direction. In the opposite case, when the dividing line is horizontal and the divided line vertical, the same illusions are acting in opposite directions.

As one of the main results it was pointed out that only in the case of the L figure, did the illusion of the dividing line disappear completely, and that here the whole illusory effect was due to the OV. Therefore only the L figure will illustrate the vertical-horizontal illusion. For this reason the L figure was used in the subsequent experiments.

FRAME OF REFERENCE HYPOTHESIS

The general frame of reference hypothesis was introduced directly by the line experiment (II) which was based on the work of Rubin and Koffka.

Rubin (II, refs. 3, 4) found that a visual perception is normally divided into two fields: a figure, which is usually the object of attention, and a ground, which occupies the rest of the perception. Koffka (II, ref. 2) pointed out the framework character of the ground by its influence on the shape of the figure. In our experiment the figure-ground problem was approached quantitatively. The experimental situation was simplified. A line and a square were chosen, the former as one of the simplest figures and the latter as one of the simplest frames. The purpose of the experiment was to investigate how the frame size influences the length of a line as figure enclosed within that frame.

It was found that the size of the square as frame influenced considerably the length of the line. The larger the square, the longer the line must be objectively if its length is to appear equal to that of the constant line in the middle of the standard square. Consequently an increase in the size of the frame reduces the subjective length of the line drawn in it, as if it were compressed. The objective length of the line experimentally

obtained was a logarithmic function of the area or side of the square frame (Figs. 2 and 3, II). Observations made during the experiments indicated that in the line-frame articulation the frame has influence also in the vertical direction. Lines of equal thickness appeared thin in the large squares, and thick in the small ones. So the frame influenced the enclosed line in both main directions at the same time. There is reason to assume that the same influence occurs also in more complex figure-frame situations.

The results of the line experiment, as mentioned above, suggested to the present writer that our visual field may be regarded as a frame of reference which encloses all that we perceive. Within that frame all figures and things have a certain position in relation to it. One figure comes very near to the frame boundary in the vertical direction, another is more distant from it; one is placed horizontally, another again lies slanting at a certain distance from the boundary. They are all influenced by the frame of the visual field in different ways, depending mainly on the nearness to the frame in a certain direction.

The nearness of figures in relation to the frame is determined chiefly by the shape of the visual field which is unchanged in normal conditions.

The shape of our visual field is approximately elliptical or oval with its longer axis horizontal. In this lying oval shape the vertical and horizontal directions are not equivalent. The vertical direction is more compressed than the horizontal. The inequivalence of both main directions exerts functional influences on the perception of figures within the visual field. If two lines of equal length, one vertical and the other horizontal, are placed in the center of this field, the vertical line is nearer to the upper boundary than the horizontal line to the right frame (Fig. 1, III). According to the line experiment, it is to be expected that the vertical line will appear longer than the horizontal and will be overestimated.

The main purpose of the present series of investigations is to find out how the shape of the visual field as a frame of reference influences the perception of figures.

Some previous investigators have mentioned the visual field. Külpe (1) pointed out as long ago as 1893 that the visual field is smaller in the vertical direction than in the horizontal. So the experience of the horizontal line by contrast with the longer visual field will be shortened as compared with the vertical which has a smaller field to contrast with. Valentine (I, ref. 21), however, found that the suggestion that the vertical-horizontal illusion is caused by contrast with the visual field is dis-

proved by the fact that the illusion was not less for one eye taken alone than for two eyes together. Later Mayer-Hillebrand (3) again suggested the possibility that the vertical-horizontal illusion might be due to the elliptical shape of the visual field, without any experiments. Feilchenfeld (X, ref. 2), without any quantitative measurements, tried to explain with the shape of the visual field the overestimation of the nasal halves in the bisection of a horizontal line. Hofmann (X, ref. 8) and Tschermak (X, ref. 18), however, considered this suggestion invalid.

The general frame hypothesis of the visual field was studied with special regard to the vertical-horizontal illusion and was further exemplified by the bisection of a horizontal line and the subjective center of a square diamond.

VERTICAL-HORIZONTAL ILLUSION

The overestimation of the vertical direction as compared with the horizontal direction of equal length has been known for more than one hundred years. Fick (I, refs. 4, 5) was first, in 1851, to draw attention to the discrepancy between vertical and horizontal judgments, and Wundt (I, ref. 24) published the first systematic study of that phenomenon in 1859. During one hundred years various attempts have been made to explain the overestimation of the vertical direction. The most interesting of these theories are the eye-structure theory of Fick, the eye-movement theory of Wundt, the perspective theory of Thiéry, the empathy theory of Lipps and the anisotropic space theory of Koffka (III, ref. 3). None of these theories has given a wholly satisfactory explanation.

An attempt was made by the present writer to demonstrate that the shape of the visual field as a frame is one of the factors which influences the estimation of the vertical and horizontal directions so that the vertical direction will be overestimated.

From the general frame of reference hypothesis several predictions were made which were tested by corresponding experiments.

Darkness Experiment

One of these predictions was that the OV should disappear or decrease significantly in complete darkness where the visual field has no distinct frames (III).

Experiments in light and in dark conditions were conducted with the same Ss. In the dark condition the room was completely dark during

the adjustments of S_v by the S. The L figure was exposed in the central part of a circular surface by switching on the light (Fig. 2, III).

It was found that in the dark condition the OV was reduced by 30 % (Table 1, III), and that this decrease was significant not only for the whole group but also for the majority of individual Ss.

Surrounding Fields Experiment

In this experiment (IV) the frame hypothesis was tested by systematic variation of simple geometrical figures which were more or less similar to the shape of the visual field. Two sets of figures were chosen as surrounding fields to the L figure. The elliptical set consisted of a standing ellipse (with the longer axis vertical), a circle, and a lying ellipse (with the longer axis horizontal). The rectangular figures were a standing rectangle, a square, and a lying rectangle. The corresponding longer and smaller axes or sides of these figures were equal.

In the standing ellipse and rectangle, the vertical line was more distant from the upper boundary of the surrounding field than in the case of the lying figures (Fig. 1, IV), while at the same time the relationship between the horizontal line and the frame is the reverse. In the circle and square, because of the equal diameter and side, the distances of the vertical and horizontal lines from the frames were the same. In the corresponding elliptical and rectangular fields the position of the L figure in relation to the boundary as frame was the same. Under such conditions three testable predictions were made.

(1) The OV in the circle is greater than in the standing ellipse and smaller than in the lying.

(2) The OV in the square is greater than in the standing rectangle and smaller than in the lying.

(3) There are no significant differences between the circle and square, between the standing ellipse and standing rectangle, or between the lying ellipse and lying rectangle.

The stimulus pattern was exposed in one of six geometrical frames. The point where the vertical and horizontal lines intersected was also the center of the surrounding field. The S had to adjust the length of the vertical line so that it appeared equal to the horizontal line.

The results are summarized in Table 1 (Tables 1, 2 and 3, IV). As expected, the OV was greatest in the lying figures, smaller in the symmetrical figures (circle and square) and smallest in the standing figures. The differences between the standing and symmetrical figures as well

TABLE 1. *Overestimation of the vertical line (in per cent) in different surrounding fields when compared with the horizontal line of 50 mm.*

Figure	Standing	Symmetrical (circle, square)	Lying
Elliptical	2.4	4.0	5.8
Rectangular	2.5	4.4	6.0

as between the symmetrical and lying figures were significant, but not between the corresponding elliptical and rectangular figures (Table 5, IV). This means that the OV depends on the shape of the surrounding fields, where the position of the figure in relation to the frame is changed. The OV does not depend on the shape of such surrounding fields where the relationship between the figure and the frame of the field is unchanged.

Interocular Differences

In the monocular visual field the fixation point is normally nearer to the nasal than to the temporal frame. Therefore the position of the L figure in relation to the frame is different in the left and in the right visual fields. In this connection two L figures were used: the right L figure, where the horizontal line extended to the right of the vertical line, and the left L figure, where the horizontal line was to the left. When the right L figure is seen by the left eye, its horizontal line is nearer to the nasal frame as compared with the right eye where it is more distant (Fig. 1, V). The left L figure, on the contrary, is nearer to the nasal boundary in the right monocular visual field. In the binocular field both L figures had the same relation to the boundaries.

Six conditions were arranged: (1) The left eye and the left L figure. (2) The left eye and the right L figure. (3) The right eye and the left L figure. (4) The right eye and the right L figure. (5) Both eyes and the left L figure. (6) Both eyes and the right L figure. In all conditions the fixation point was the same, and the head was held in the same position.

Great interocular differences were found (Tables 1, 2, 3 and 4, V). In the monocular visual fields, the OV was different for both figures, as expected: when seen with the left eye, the left L figure had the larger OV; when seen with the right eye, the right L figure had the larger OV. In the binocular visual field, both L figures had the same OV. The OVs of the nasal parts of the monocular visual fields were equal, also those of the

temporal parts, but highly significant differences were found when the nasal monocular OV was compared with the temporal. The binocular results did not differ from those of the monocular when they were compared with the mean OV for the left and right eye. When the comparison was made with the OVs of the nasal and temporal monocular, the binocular OV was greater than the former but smaller than the latter.

Head Inclination Experiment

By inclining the head from the normal vertical to the horizontal position the frame of the visual field is changed completely. In the vertical position the oval shape of the visual field was extended horizontally, while in the horizontal position the vertical axis was longer (Fig. 1, VI). This change in the orientation of the field should influence the subjective estimation of the vertical and horizontal directions. The position of the L figure in relation to the frame is, in the horizontal head position, the reverse as compared with the normal head position. So it was to be expected that the OV would change into an overestimation of the horizontal line (OH) in the inclined head position.

Here two conditions were compared: (1) the vertical condition where the head was in the normal vertical position, and (2) the horizontal condition where the head of the S was horizontal and the right eye was below the intersection point of the lines in the L figure. In the complementary experiment with the horizontally inclined head the left eye was below the intersection point and the right eye was above it.

It was found that the OV changed into an OH (Table 1, VI). In the vertical condition the OV was 3.7 % and in the horizontal condition the OH was 3.2 %. The complementary experiment confirmed the results of the main experiment (Table 5, VI),

Artificial Visual Fields

In this experiment (VII) the frame hypothesis was tested by artificial visual fields. Five different shapes of artificial fields were used (Fig. 1, VII). Two of these fields were lying ovals, one more and the other less compressed vertically, the third was circular and two others were standing ovals, one again less and the other more compressed horizontally. The ratio of the vertical axis to the horizontal (V/H) in these artificial fields was 0.50, 0.75, 1.00, 1.33 and 2.00. According to our hypothesis, it was to be expected that the OV would successively decrease with increasing (V/H).

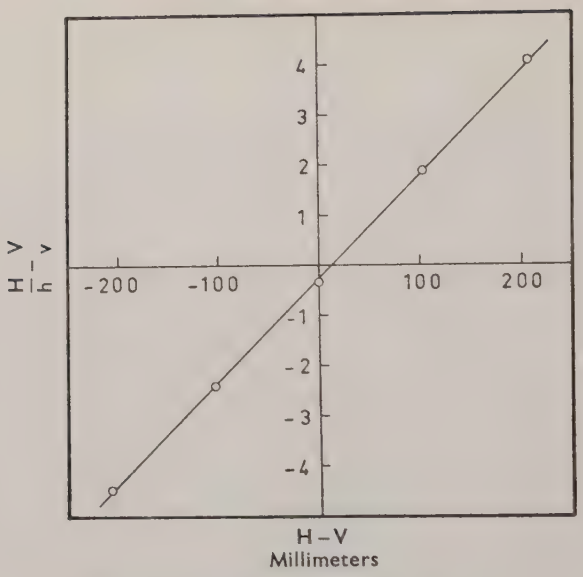

Figure 1. The plot of (H/h – V/v) against (H – V).

The normal binocular visual field was artificially limited by special goggles (Fig. 2, VII). The S was instructed to view the L figure so that the intersection point of the two lines was in the center of the artificial field. From six conditions five were with the artificial and one with the normal binocular visual field. One of the artificial fields, namely the lying oval field, which was less compressed vertically and which had a V/H of 0.75 had approximately the same V/H as the normal visual field.

It was found that the OV was a function of V/H (Fig. 3, VII). The OV decreased with the increase of V/H (Tables 1 and 2, VII). However, none of the artificial fields used in the experiments could change the OV into OH.

The rectilinear plot of (H/h – V/v) against (H – V) in Fig. 1 indicates that the vertical-horizontal illusion may be described by the equation

$$\frac{H}{h} - \frac{V}{v} = a + b\,(H - V)$$

or

$$\frac{1}{v} = \left(\frac{1}{h} - b\right)\frac{H}{V} + b - \frac{a}{V},$$

where v = length of the vertical line, h = length of the horizontal line, V = length of the vertical axis of the visual field in the stimulus plane,

H = length of the horizontal axis of the visual field in the stimulus plane, and *a* and *b* are parameters.

One possible implication of this equation is that the OV is completely determined by (1) the shape and (2) the size of the visual field; as H and V tend simultaneously to ∞, the equation can be simplified to

$$1/v = 1/h$$

meaning the total disappearance of the vertical-horizontal illusion.

It must be pointed out, however, that the above-mentioned equation is derived from one experimental series only. Its applicability to the other experimental conditions should be investigated by means of additional experiments.

Fixation Experiment

The vertical-horizontal illusion was observed under two conditions: with fixation and without fixation. In the O-Condition (without fixation) only the illusory effect—the OV—was of influence. In the F-Condition (with fixation) the illusion was combined with the figural after-effect. The fixation time in the F-Condition immediately before the adjustment was 5 seconds.

The results indicated that the O-Condition had a significantly larger illusory effect than the F-Condition (Table 1, VIII). Therefore it was concluded that the mechanisms underlying the vertical-horizontal illusion and the figural after-effect must be assumed to be different.

Ratio Rating

An attempt was made to obtain measures for the subjective length of vertical and horizontal lines. The generalized ratio rating method of Ekman (IX, refs. 1, 2) was used, by which one may obtain two separate scales for stimuli which are compared under two different conditions.

Six standard stimuli were selected for the vertical line as V stimuli. The same lengths were also used for the horizontal line as H stimuli. Each V stimulus was combined with every H stimulus. The S was instructed to report, in per cent, the apparent ratio of the shortest to the longest line.

Two separate sets of scale values, one for the vertical and the other for the horizontal condition, were obtained (Table 1 and Fig. 2, IX). The OV was 7.1 %. Power functions were fitted to the experimental data. Individual functions indicated a moderate variability among Ss (Table 2, IX).

BISECTION AND DIAMOND

The influence of our visual field as a frame of reference is further exemplified by the bisection of a horizontal line and the subjective center of a square diamond.

Bisection Experiment

The bisection experiment (X) was undertaken to investigate to what extent the shape of the monocular field as frame influences the interocular differences in the bisection of a horizontal line.

When the center of a horizontal line is fixed monocularly with the left or right eye, the position of the line in relation to the frame is different in both monocular visual fields. In the left field the right half of this line is nearer to the boundary and should appear longer than the left (Fig. 1 A, X). At the bisection of this line, where the S has to divide the line into subjectively equal parts, the left part will be underestimated, and in order to appear as long as the right it should be objectively longer than the right. In the case of the right eye, the right side should be underestimated (Fig. 1 B, X). In this meaning great interocular differences in the bisection may be expected.

In order to see how much the interocular differences in bisection are due to the visual field as frame, the bisection is carried out in circular monocular fields (Fig. 2, X). In this artificial visual field it was to be expected that interocular differences would decrease.

Four conditions were arranged: (1) The left eye in the normal visual field. (2) The right eye in the normal field. (3) The left eye in the circular artificial field. (4) The right eye in the same artificial field. In the case of the artificial field, the normal monocular visual field was limited by the special goggles mentioned above. The task of the S was to bisect a line of 100 mm.

As expected, highly significant interocular differences were found in the normal visual field. These differences were reduced in the artificial field. The decrease was greater with the left eye than with the right. The former trend was significant but not the latter (Tables 1 and 3, Fig. 4, X).

Diamond Experiment

The purpose of the diamond experiment (XI) was to investigate to what extent the shape of the monocular visual field as frame influences the interocular differences both for the horizontal and the vertical diagonal

distances, which may be found in the bisection of these distances by the center point of the diamond.

The center of a square diamond is equidistant from all four angle points. This permitted the bisection of the horizontal and vertical diagonal distances at the same time. The position of the horizontal distance to the visual frame is different in the fields of the left and right eye. Thus interocular differences may be expected in the bisection of the distance in that direction, like those in the bisection experiment (X). The same positions of the vertical diagonals in the frames do not give rise to any significant interocular differences in the bisection (Fig. 1 A, XI). In the case of the circular artificial fields, the interocular differences in the horizontal diagonal should be decreased and the results in the vertical direction should be still unchanged (Fig. 1 B, XI).

A square diamond with the equal horizontal and vertical diagonal distances of 100 mm was used as stimulus pattern. Four conditions were arranged, the same as those in the bisection experiment. The task of the S was to bisect both diagonal distances by the center point.

Great interocular differences were found in the bisection of the horizontal diagonal distances when the visual field was normal (Tables 1 and 2, Fig. 2, XI). The left eye underestimated the left side, while the right eye underestimated the right part. The difference between both eyes was 2.22 mm which was highly significant. In the circular artificial field this interocular difference was reduced to 0.88 mm. This considerable decrease was due to the two trends: (*a*) The left eye difference between the left and right halves decreased from 1.50 mm to 0.68 mm, and (*b*) the right eye difference increased from -0.73 mm to -0.20 mm. Both trends were significant.

In the case of the vertical diagonal, the interocular differences were very small, only 0.30 mm in the normal visual field and 0.16 mm in the artificial field (Tables 3 and 4, Fig. 3, XI). Neither of the differences was significant. So the subjective center for the left and right eye, as expected, differed in horizontal direction only.

DISCUSSION

All experiments gave the same results. The different position of the vertical and horizontal lines in relation to the frame of reference of the visual field influenced their apparent length. The differences in the position to the same frame had influenced also the interocular differences

in the bisection of a horizontal line and in the subjective center of a square diamond.

In the case of the binocular visual field, as mentioned above (experiment on interocular differences, V), the OV did not differ from that of the monocular as was also indicated by Valentine (I, ref. 21). This does not seem to be consistent with the shape of the binocular visual field. However, it must be kept in mind that the binocular field, strictly speaking, is only the central part of the total visual field where the two monocular fields overlap (Fig. 1, V), as pointed out by Gibson (V, ref. 1). To the right and left of the overlapping areas the binocular field is actually the same as the lateral parts of the monocular fields. In this respect the binocular field is actually compressed horizontally, which may reduce its OV. There is also a phenomenological difference between binocular and monocular vision which does not affect the comparison of the two monocular fields. The stimulus figure seems in the binocular vision to be clearer, brighter and slightly larger than when it is seen monocularly. And finally, there was one case where the binocular OV was larger than the monocular, when it was compared with the nasal monocular OV.

In the experiment with the artificial visual fields (VII) two fields had the ratio V/H equal 1.33 and 2.00 which means that here the vertical axis was longer than the horizontal. It might be expected that in these conditions the OV would change into an OH. However, this was not the case. Although the OV decreased most in these fields, it did not change into an OH. Similarly in the surrounding fields experiment (IV) the OV decreased most in the standing ellipse and rectangle but did not change into an OH. This indicates another factor which at the same time influences the OV and which does not depend on variation of V/H in the artificial fields or surrounding fields. It is very conceivable that with greater variation of V/H we may compensate the OV even to the extent that it changes into an OH. In the head-inclination experiment (VI), however, where the head was in the horizontal position the OV was changed into an OH.

Also some other experiments indicated that in addition to the shape of the visual field it may be assumed that one or more additional factors are of influence. In the darkness experiment (III) the OV did not disappear completely. Similarly in the bisection (X) and in the diamond experiment (XI) the remaining significance of the interocular differences is easiest to explain with an additional factor.

In an unpublished report on an experiment with some different inclinations of the L figure, Künnapas and Karjel (2) found that at an inclination of 45 degrees the vertical-horizontal illusion disappeared totally. This result indicated that at the inclination of 45 degrees the two tilted lines of the L figure are equal. Similarly it may be expected that at the same inclination of the head the vertical and horizontal directions would be equivalent.

CONCLUSIONS

(1) The experimental results of this series of investigations permit the conclusion that the visual field may be regarded as a frame of reference and that the position of figures in relation to this frame exerts influence on the perception of figures.

(2) In particular it has been shown that the overestimation of the vertical direction is a function of the shape of the normal visual field.

(3) Several experiments indicate that one or more additional factors also contribute to the overestimation of the vertical direction.

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V. Acta Psychol., 1957, **13**, 253–259 (& Nord. Psykol., 1957, **9**, 195–201).
p. 195: line 1, *for* phenomenogically *read* phenomenologically.
X. Acta Psychol., 1958, **14**, 375–383 (& Nord. Psykol., 1958, **10**, 207–215).
p. 215: line 9, *for* 1925 *read* 1905.
p. 215: line 20, *for* 408 *read* 407.
p. 215: line 34, *for* Emden *read* Embden.

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